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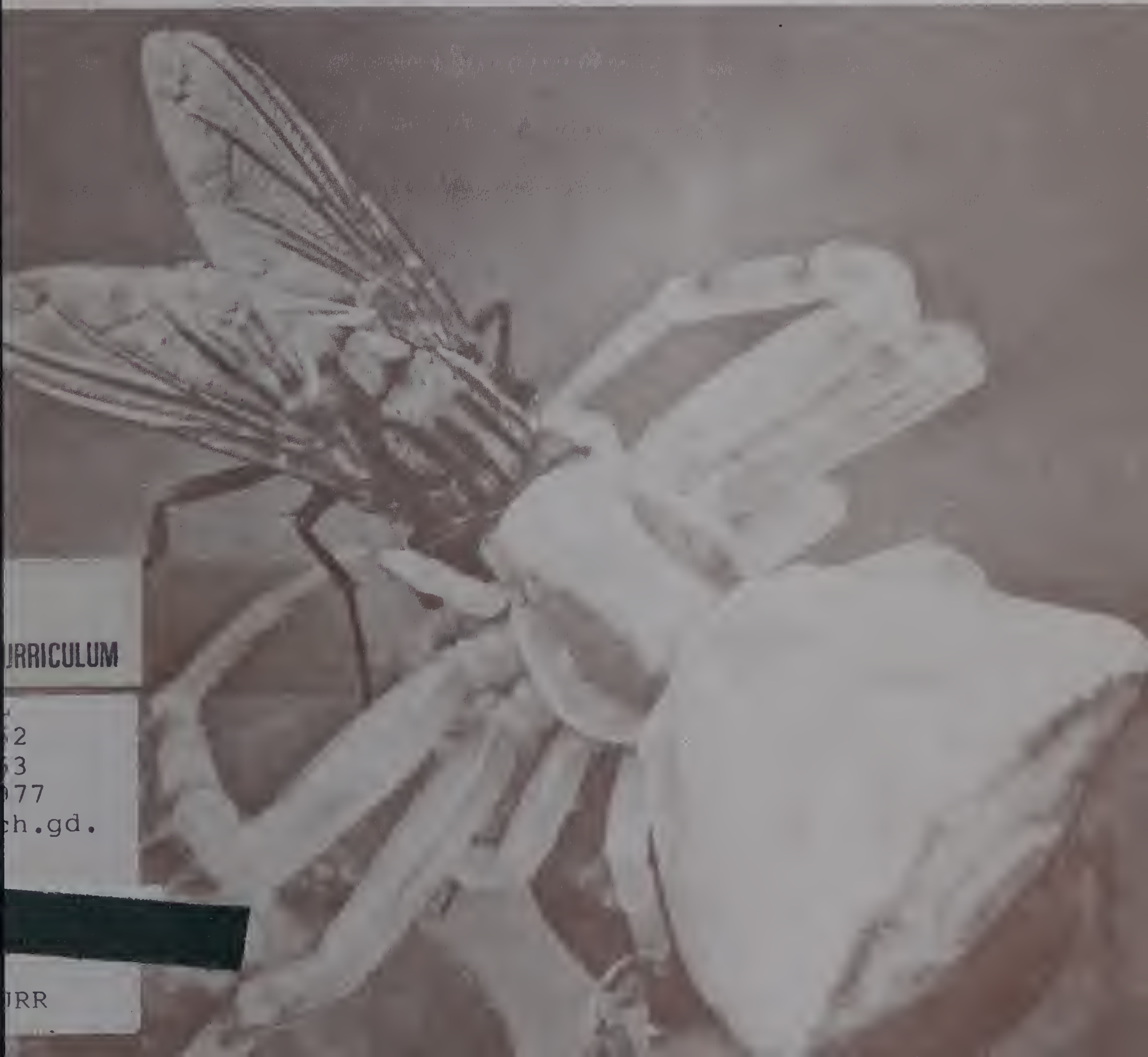
Examining Your Environment

Small Creatures

A GUIDE FOR TEACHERS



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Small Creatures

Examining Your Environment

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INTRODUCTION

Small Creatures is a text to help students to learn about the invertebrate class of the animal kingdom. The animals of this class are found almost everywhere from city core to the farm and from coast to coast. Some "small creatures" have even been found at altitudes of several metres. Weather is no deterrent to them, either. Have you ever seen small black specks on white glistening snow during a bright midwinter day? Chances are these are snow fleas that have made their way to the surface from under the ground. Just one example of the fact that small creatures are surprisingly available.

Traditional approaches to this topic have had students study insect life in detail. No effort is made in this book to follow a traditional approach or to develop a group of entomologists. Instead, by using a variety of small creatures including insects, spiders, crustaceans and other anthropods, young learners are given a chance to develop specific inquiry and social skills. Hopefully, through these inquiries and others of their own, the students of the middle grades develop to a useful degree the rational powers of thought that will pay them lifelong dividends in daily living.

Selecting Activities

CHAPTER	DESCRIPTION
1. *What Is It?*	Highlights observing, classifying, and identifying skills and should be taught first.
2. *Shoo, Fly!*	Gives practice in controlling variables and carrying out experiments.
3. *Creatures Underfoot*	Contains activities relevant to particular types of creatures and covers a variety of skills areas.
4. *On the Wing*	Contains activities relevant to particular types of creatures and covers a variety of skills areas.
5. *Spiders Are Different*	Contains activities relevant to particular types of creatures and covers a variety of skills areas.
6. *Creatures on Display*	Contains concluding activities for a rounding-off unit.

With the above as a guide, select activities that teach skills that you believe to be lacking in your students, or activities that can be used for developing interest and motivation. If you feel that the activity is suitable and enough equipment can be obtained, then organize a lesson or a series of lessons based on the activity that you have chosen. If it is impractical to carry out a particular activity, perhaps a variation of the activity can be substituted. Once the skills have been mastered, the students can be encouraged to employ them to find out more about what interests them.

Guiding Student Inquiry

Some of the photographs in the student's text show boys and girls doing investigations. These photographs illustrate techniques that might be difficult to understand. The captions usually provide questions that guide the students to interpret the main ideas and draw attention to subtleties of technique. Other photographs illustrate phenomena related to the problems that the students will be investigating.

Before attempting each activity, you might direct your students to read the captions carefully. By discussing the photographs and captions in small groups or as a class, your students can gain insight into the content of the chapter. Hopefully, some photographs will stimulate questions that will lead to activities that the students themselves devise and conduct. When this happens, your students have progressed to the threshold of open-ended inquiry, the most desirable type of learning experience. The quality of these open-ended investigations will depend on the skills developed from more directed activities and on your ability to provide guidance at critical times.

Diagrams, charts, graphs, and drawings are included to guide the students in conducting their activities or to help them in recording their data. Encourage the students to use these aids. The cartoons provide enjoyment by presenting related concepts in a humorous way. Discussion of these by students in small groups can help clarify the ideas presented in the activities.

To organize your classroom, you might set up several learning stations with different activities from the same chapter. The equipment and materials necessary for each activity should be readily available at each station or elsewhere in the classroom. The books, open at the appropriate pages, can be used as work cards. You might find it necessary to organize data-collecting sheets for the students. Some type of rotation can also be employed to take best advantage of the learning stations. For other suggestions, refer to the series overview, *Examining Your Environment, An Introduction for Teachers,* pages 31 to 37.

Since many of the activities take place outdoors, remember to inform parents and other people in the community of your plans. Be sure to obtain permission from appropriate sources and also to send out letters of thanks afterwards. These simple acts will do a great deal towards maintaining good public relations.

The sequence of steps for carrying out an activity might be:

1. The students could read the activity carefully and organize themselves to conduct the investigation from beginning to end.
2. Students could invite you to their group and outline their plans for your approval and revision, if necessary.

3. They could conduct the investigation.
4. The students could answer the *Digging Deeper* questions as well as appropriate values clarification activities suggested in this guide.
5. A reporting session can be organized so that you can gather feedback on how well the groups have progressed. The students then have a chance to report and compare their findings with other students. New avenues of investigation, as well as skill teaching and reteaching, can grow out of this reporting session.

Once the students have completed the initial investigations as a class endeavor, you might invite them to pursue new investigations. For this, you could organize the students into groups. Each group could leaf through the activities in the rest of the chapter and decide which one they wish to pursue. It will be interesting for you to see how the students make this decision. There may be implications for teaching some group interaction processes. (See *Examining Your Environment, An Introduction for Teachers,* pages 31 to 37.)

Capitalize on students' questions arising out of the activity that has just been completed and guide the students to devise their own activities to answer their questions. The students will require a great deal of help when they first attempt to organize their own investigations. Try to be patient and helpful, but hold them accountable for the skills that they have just learned.

How to Use this Guide

Each teacher's guide corresponds to a book in the *Examining Your Environment* series. Every activity is analysed under several headings. When using the guidebooks, you should first read the activity in the text, as this background is needed to understand the references under some headings.

TIME

The estimated time needed to complete the activity under normal circumstances is stated under this heading.

SEASON

Under this heading, the most suitable seasons for carrying out the activity are considered. Whether the activity is to take place indoors or outdoors is also indicated.

CLASS ORGANIZATION

Here hints are given as to the ideal number of students that could perform an activity. This does not mean that more than one group could not try the same activity, if this is practical. Some activities are recommended for the whole class; other activities for smaller groups.

EQUIPMENT AND MATERIALS

Listed here are the items that will be required for each group to carry out the activity.

SKILLS AND TECHNIQUES

This column lists the main skills and techniques a student will need to carry out an activity. These items should form the instructional objectives for the activity and be the criteria for most of the evaluation to follow. The information under this heading provides insight into items that may require preteaching or review.

CONCEPTS

As a result of completing the activities, the child should have gained some general knowledge. Only the major concepts have been listed. Often they have been expressed in general terms and may be oversimplified.

SUGGESTIONS FOR VALUE TEACHING

Under this heading you will find value learning statements or questions that you could use to guide the students to determine what the activity means to them. Of course, you will, no doubt, have your own original ideas as to the type of exercises that will encourage your students to gain greater meaning from their studies and you should use your thoughts to augment the suggested ones. See the section on *Value Learning* and *Clarifying Values* in *E.Y.E., An Introduction for Teachers.*

CLUES TO QUESTIONS

Because the answers often relate directly to the data collected, many of the answers to the questions in the *Digging Deeper* sections will depend upon the circumstances. Some of the factors that might be considered in answering a question have been listed.

TROUBLE SHOOTING

Under this heading is a checklist of items that could help to account for the success or failure of an activity.

VOCABULARY

Under this heading you will find words the students should be able to add to their vocabularies after completing the activity.

RESOURCES

Both the text and the bibliography contain suggestions for obtaining special materials when they are required. Under this heading are listed *other* possible sources of ideas and supplies.

CROSS REFERENCES

Reference is made to a particular book when a required skill has been more fully developed in that book or when the same apparatus can be used in another activity in the book mentioned.

1. WHAT IS IT?

Activity 1:
Where can small creatures be found?

TIME
30 minutes

SEASON
spring or fall

CLASS ORGANIZATION
students work independently

EQUIPMENT AND MATERIALS
5 small containers, e.g. pill vials
masking tape
pencil

SKILLS AND TECHNIQUES
- collecting small creatures
- labelling containers
- using a hand magnifier to observe carefully
- using data and observations to infer answers to the *Digging Deeper* questions

CONCEPTS
Small creatures include an invertebrate animal.

SUGGESTIONS FOR VALUE TEACHING
Why does the activity suggest that only one creature of any one type be collected? When you have completed the activity what do you plan to do with the creatures that you have collected?

CLUES TO QUESTIONS
Answers will differ for each class.

TROUBLE SHOOTING
- Students may collect small toads or frogs and want to include them in their small creatures collection. Although the purpose of this book is to study invertebrate animals, small vertebrates can be allowed until the students notice the differences. If you plan to conduct *Activity 2* on the same day as *Activity 1*, use the same creatures. Otherwise have the students release their animals and collect new ones when you plan to continue with the activities.

VOCABULARY
label
specimen

Activity 2:
How can small creatures be grouped?

TIME
45 minutes

SEASON
spring or fall

CLASS ORGANIZATION
small groups of three or four students to a group
(Each group should be made up of students who have collected creatures from different places.)

EQUIPMENT AND MATERIALS
For each group:
small creatures in labelled pill vials
(from previous activity or collected for this one)
chart paper
felt pens
or
blank classification charts duplicated by teacher
pencils

SKILLS AND TECHNIQUES
- classifying creatures according to where they were found
- using the groupings to develop a classification system
- using the classification system to infer answers to the *Digging Deeper* questions

CONCEPTS
A classification system can be developed using a variety of criteria for the groupings. The system is valid depending on whether each creature is grouped correctly according to the stated criteria.

SUGGESTIONS FOR VALUE TEACHING

How do you feel about handling small creatures? Mark your position on the following scale:

Handle Harry carries his favorite creature in his pockets.	Leave-Alone Larry starts to shudder and scream when he is in the same room as a small creature.

0 10

Explain your position.

CLUES TO QUESTIONS

The *Branching Out* activity will help to clarify classification systems.

TROUBLE SHOOTING

- This activity is best done on the same day and as a follow-up to *Activity 1.* If this is not possible, students will have to decide what to do with their creatures at the end of this activity. This decision-making can be useful as a valuing exercise.

VOCABULARY

classify	*taxonomy*
classification system	*taxonomists*

Activity 2:
How can small creatures be grouped according to their body parts or structure?

TIME

45 minutes

SEASON

spring or fall

CLASS ORGANIZATION

small groups of three or four students per group

(If students have freed their creatures from the previous activity, their homework assignment can be to bring 5 small creatures each to school for this activity.)

EQUIPMENT AND MATERIALS

For each group:

a hand magnifier (magnifying glass)
small creatures in pill vials (from previous activity or collected for this one)
chart paper
felt pens
or
blank classification charts duplicated by teacher and students

SKILLS AND TECHNIQUES

- observing body structure carefully
- using a hand magnifier
- classifying small creatures according to body parts
- developing a 4- or 5-stage classification system
- using the classification system developed to infer answers to the *Digging Deeper* questions

CONCEPTS

Taxonomists classify animals according to their body structure. A classification system can be developed to group small creatures according to their body parts.

SUGGESTIONS FOR VALUE TEACHING

Have each student complete this exercise individually:

1. *On the whole I think this activity was: (circle one)*

very poor	poor	fair	50-50	good	very good	excellent

2. *The best parts of the activity were:* __________

3. *The worst parts of the activity were:* __________

4. *The activity would have been better if we had:* __________

5. *During our next activity I would like to see us:* __________

Have the individual answers discussed and let the students work together to design a sheet so that everyone in the group agrees with the answers.

CLUES TO QUESTIONS

A small creature could be classified several times in a system since each stage addresses itself to a different body part. The number of creatures in each group should become smaller as new stages are added to the classification system. The creatures in the last stages of the system should be more similar than the ones in the groups in stages one and two. If students are encouraged to conduct the *Branching Out* activity, they will gain a better understanding of taxonomy.

TROUBLE SHOOTING

- Each group should have a hand magnifier so that the members can observe the body parts more closely.
- Students may have difficulty with the first stage which determines vertebrates and invertebrates.

VOCABULARY

vertebrates
invertebrates
body structure

Activity 4:
How can an identification key be used to identify small creatures?

TIME

45 minutes

SEASON

spring or fall

CLASS ORGANIZATION

as individuals or in groups of two students per group

EQUIPMENT AND MATERIALS

For each group:
pill vials containing small creatures (perhaps from previous activity or specifically caught for this one)

SKILLS AND TECHNIQUES

- using an identification key to identify small creatures
- observing carefully
- comparing actual creatures with illustrations and descriptions

CONCEPTS

One major purpose in classifying small creatures is to enable people to identify them. An identification key can be used to name small creatures.

SUGGESTIONS FOR VALUE TEACHING

Mark your position on the Handle Harry/Leave-Alone Larry scale again (see page 2).

Handle Harry = ______________________
Leave-Alone Larry = ____________________

Has your position changed? Can you explain why? After you have conducted the activities in each chapter of this book, mark your position on the scale to see if your feelings about handling small creatures changes.

CLUES TO QUESTIONS

The *Branching Out* activity will help to reinforce the skills of classification and identification.

TROUBLE SHOOTING

- It is suggested that you help the students identify one or two creatures according to the directions on page 12 before you allow them to proceed on their own.
- The identification key does not show aquatic animals. A picture key on aquatic environments can be found in library books and might be helpful. Since the key in the text is a simple key, students will not be able to name the type of butterfly, moth, beetle, etc. that they have found. For students who want to pursue this aspect of identification, suggest field guides (the picture sections) on insects, spiders, and so on. Some of these guides are listed in the bibliography and might be available in your school or public library.

RESOURCES

field guides and a number of titles in the bibliography, page 89

CROSS REFERENCES

Small Creatures contains an identification key for spiders (pages 66-71).

2. SHOO, FLY!

Activity 1:
What is a simple way to catch houseflies?

TIME
45 minutes

SEASON
spring, winter or fall

CLASS ORGANIZATION
groups of five or six students per group (These groups could remain constant for the activities in this chapter.)

EQUIPMENT AND MATERIALS
For each group:
butterfly or aquarium net
25 small containers, e.g., pill vials

CONCEPTS
Houseflies are difficult to catch. They are able to take off in any direction at an angle of up to 60°.

CLUES TO QUESTIONS
The *Branching Out* activities will give students a better understanding of a housefly's mobility and body structure.

TROUBLE SHOOTING
- For groups that might want to make a net to catch flies, see page 53.

Activity 2:
How can a fly colony be set up?

TIME
45 minutes

SEASON
spring, fall or winter

CLASS ORGANIZATION
groups of five or six students per group (May be the same groups as for *Activity 1.*)

EQUIPMENT AND MATERIALS
For each group:
wide-mouthed jar (5 litre)
Bristol board
scissors
2 empty plastic containers (cream)
cheesecloth or other lightweight netting
needle and thread
large elastic band
small elastic band
cotton batting
powdered milk
water

SKILLS AND TECHNIQUES
- following directions to build a fly cage

SUGGESTIONS FOR VALUE TEACHING
Some questions for your group to discuss after you have completed your cage:
Do I refrain from disturbing my neighbors?
Do I take care of materials when I borrow them?
Do I return materials to the proper place so that others may use them?
Do I listen to other's suggestions when I work in a group?
Do I solve problems between myself and other members of the group?

CLUES TO QUESTIONS
An entomologist is a scientist who investigates insect behavior.

TROUBLE SHOOTING
- Students should be able to collect all of the materials for the cage, if you give them a few days notice.

VOCABULARY
entomologist

Activity 3:
Where do houseflies prefer to lay their eggs?

TIME
30 minutes to set up the experiment
15 minutes on the following day

SEASON
spring, fall or winter

CLASS ORGANIZATION

same groups as for *Activities 1 and 2*

EQUIPMENT AND MATERIALS

For each group:
2 empty cream containers
bran cereal flakes
powdered milk
water
mixing container
hand magnifier

SKILLS AND TECHNIQUES

- conducting a controlled experiment
- following directions
- observing carefully when using a hand magnifier
- using observations to infer answers to the *Digging Deeper* questions

CONCEPTS

Female houseflies will only lay eggs in moist organic material.

SUGGESTIONS FOR VALUE TEACHING

You conducted an experiment to find out in what type of material flies lay their eggs. You could have learned the same information by reading a few sentences in a book on houseflies. Which way do you prefer to learn? Mark yourself on this scale to show your choice.

Experimental Elrod likes to discover for himself and experiments by himself at home.

Factual Fanny wants to be told everything she learns.

Explain your position on the scale.

CLUES TO QUESTIONS

This was a "fair" activity if all of the factors were kept the same except for the two types of egg-laying material.

TROUBLE SHOOTING

- Encourage students not to give up if they do not observe eggs on the second day. Scientists are not always successful on their first attempt.

VOCABULARY

controlled *experiment* *mask*

Activity 4:
What hatches from a housefly egg?

TIME

45 minutes to set up
10 minutes a day for 6 days
or
45 minutes on days 2, 3 or 4 if *Branching Out* experiments are done simultaneously
(The activity should start on a Monday morning, if possible.)

SEASON

spring, fall or winter

CLASS ORGANIZATION

groups of five or six students: the same as for the previous activity

EQUIPMENT AND MATERIALS

For each group:
100 fly eggs from *Activity 3*
a bran-milk mash
toothpicks
a clear plastic ice cream container
napkin
elastic band
hand magnifier
baby food jar cap or equal
large container in which the plastic one will fit

SKILLS AND TECHNIQUES

- following directions
- observing carefully using a hand magnifier
- sketching a fly larva

CONCEPTS

Fly eggs hatch into larvae (maggots), the second stage in the four-stage life cycle of the housefly.

CLUES TO QUESTIONS

Under normal conditions the larva grows larger until the fifth day when it gets ready to pupate. The larva turns reddish-brown during the fifth and sixth days after it has migrated away from its food source to a dark place in order to pupate. The *Branching Out* activity will help students learn more about larva behavior.

TROUBLE SHOOTING

- While students observe the larva from day 2 to day 5, they could conduct the *Branching Out* activities.
- Careful and faithful observation over five days is essential to this activity. It is best to start on a Monday.

VOCABULARY

maggot
larva (larvae)
migration

Activity 5:
What happens to a mature maggot?

TIME

45 minutes to set up
15 minutes a day for five days
30 minutes after the activity has been completed to answer the *Digging Deeper* questions and discuss the results

SEASON

spring, fall or winter

CLASS ORGANIZATION

same groups as for the previous activities

EQUIPMENT AND MATERIALS

For each group:
razor blade
masking tape
25 larvae (from previous activity)

SKILLS AND TECHNIQUES

- using a hand magnifier to observe carefully
- sketching observations
- using observations to infer answers to the *Digging Deeper* questions
- controlling variables in the *Branching Out* section

CONCEPTS

At the end of the larva stage, the maggot makes a reddish-brown case that surrounds the body. Over the next several days, in the pupa stage, the larva undergoes vast changes as it turns into the adult housefly.

SUGGESTIONS FOR VALUE TEACHING

How did you feel about cutting open the pupa cases? Do you feel that scientists should kill animals in the interests of science? Explain your answer.

CLUES TO QUESTIONS

The experiments in the *Branching Out* activities will help students investigate the conditions that affect the development of houseflies inside the pupae. The main objective in these experiments is to learn the importance of controlling variables.

TROUBLE SHOOTING

If some students are hesitant to cut open the pupa cases, do not insist. Conversely, if some students appear to be particularly aggressive during the cutting, it would be wise to observe their behavior closely and possibly discuss with them our attitudes toward living things.

VOCABULARY

pupate
pupa (pupae)

Activity 6:
How do different foods affect the number of eggs a housefly lays?

TIME

45 minutes to set up
15 minutes a day for five days
30 minutes after the activity has been completed in order to answer *Digging Deeper* questions and discuss results

SEASON

spring, fall or winter

CLASS ORGANIZATION

same groups as for the previous activities

EQUIPMENT AND MATERIALS

For each group:
powdered milk
bran-milk mash

50 houseflies
hand magnifier

SKILLS AND TECHNIQUES

- controlling variables (The only factor that should be changed in the two colonies is the diet.)
- recording data in the form of a bar graph

CONCEPTS

A pure sugar diet prevents houseflies from laying eggs.

SUGGESTIONS FOR VALUE TEACHING

Some people are concerned that since chemicals like DDT have been forbidden, there has been an increase in the number of houseflies and other pesty insects. In your group, role-play a situation in which concerned citizens confront government officials about this problem. Before you conduct the role-play, you should investigate the ideas of both the citizens and the officials by asking such questions as, Why have certain chemicals been banned? What are other ways of controlling harmful insects? etc.

CLUES TO QUESTIONS

The *Branching Out* section contains several experiments that will help students investigate other aspects of housefly behavior. Also a more detailed outline of how to conduct an experiment is included. The most difficult factor to control in this activity is the different flies in the two cages. Efforts should be made to keep these two groups as similar as possible.

TROUBLE SHOOTING

- All flies should be newly-hatched in the fly colonies. In this way they will be approximately the same age and their previous diet will be controlled. Care should be taken to have the same number of female flies in each cage. (See page 23.)

VOCABULARY

colonies
sugar

Activity 7:
What is the life cycle of the common housefly?

TIME

30 minutes

SEASON

spring, fall or winter

CLASS ORGANIZATION

Students can work independently or in the same groups as before.

EQUIPMENT AND MATERIALS

library books on invertebrate animals

SKILLS AND TECHNIQUES

- matching the pictures on page 34 with the chart on page 35
- forming generalizations from previous experiences

CONCEPTS

An insect, such as the housefly, that undergoes four distinctive changes has a life cycle known as a complete metamorphosis.

CLUES TO QUESTIONS

Maggots grow larger as they feed and about the fifth day grow a reddish-brown pupa case around them.
The *Branching Out* section introduces incomplete metamorphosis and helps students understand other types of life cycles.

TROUBLE SHOOTING

- Although the pictures and charts will be helpful, the students' observations from the previous activities are the important factors in their understanding of the concepts involved.

VOCABULARY

life cycle
stages
metamorphosis

3. CREATURES UNDERFOOT

Activity 1:
Where can you find small soil animals?

TIME
45 minutes

SEASON
spring or fall

CLASS ORGANIZATION
individually or in small groups of two or three students
(If groups are used, each group might decide who will use each method of collecting suggested. If the activity is conducted individually, they can choose from the methods suggested.)

EQUIPMENT AND MATERIALS
popsicle sticks
masking tape
sponge
scissors

SKILLS AND TECHNIQUES
- following directions on a diagram to make a pair of tweezers
- collecting creatures
- using the key to identify small creatures

CONCEPTS
Small creatures inhabit all areas of the globe. This chapter deals with some of the creatures that live underground. A wide variety of species live under rocks and logs, in the soil, and in the forest litter.

SUGGESTIONS FOR VALUE TEACHING
Mark your position on the following scale:

Handle Harry   Leave-Alone Larry

Has your position changed from the first time you marked this scale? Can you explain why?

CLUES TO QUESTIONS
Most creatures found underground live in an environment that is both damp and dry. These animals will vary from earthworms, to pill bugs, slugs, millipedes, centipedes, mites, small spiders, ants, larvae, beetles, etc. The *Branching Out* section encourages students to use the key in Chapter 1 to identify the animals and to conduct further research through library books.

TROUBLE SHOOTING
- As many different underground habitats as possible should be investigated. Students will no doubt suggest places that are not listed in the activity and should be encouraged to investigate.

VOCABULARY
tweezers

Activity 2:
In what special ways can you collect small creatures underfoot?

TIME

Constructing equipment:	
"creepy crawler" separator	30 minutes
group trap	20 minutes
heat method	5 minutes
Using equipment to collect creatures	
"creepy crawler" separator	30 minutes
ground trap	overnight
heat method	30 minutes

SEASON
spring or fall

CLASS ORGANIZATION
small groups of three or four students to a group
(Each group can investigate all three methods or specialize using only one method.) The ground trap could be set up in one of the student's backyards as a homework assignment.

EQUIPMENT AND MATERIALS

For each group:

Material for a separator
  Plastic bleach bottle; scissors; small piece of Plasticine; small piece of hardware cloth (screening); light socket, 40 watt bulb, lamp and plug; wide mouth glass jar; trowel; pill vials; masking tape.
Material for a ground trap
  Large mouth, straight-sided glass jar; some liquid detergent; water; trowel; piece of cardboard; small stones; pill vials; medium-sized rock; masking tape.
Material for the heat method
  Shovel; plastic bags; large aluminum pie plate; stove or hot plate; pill vials; masking tape.

SKILLS AND TECHNIQUES

- following directions in diagram form
- using equipment to collect small creatures
- using the key to identify small creatures
- recording data in the form of a bar graph
- using data collected to infer answers to *Digging Deeper* questions

CONCEPTS

Specialized equipment can be devised and used to collect small creatures.

SUGGESTIONS FOR VALUE TEACHING

List the names of all the creatures that you caught. How would you feel if you accidentally stepped on one of them? Rank order the animals starting with those that you would feel badly about killing and going on to the ones that you wouldn't care about. As you rewrite your list, the creatures at the top will be the ones that would bother you most to hurt. The creatures at the bottom of the list will be the ones that would bother you least to hurt. All of the others should be ordered in between. With your group discuss why you placed these animals in your particular order.

CLUES TO QUESTIONS

This activity is not a controlled experiment therefore it would not be fair to state definitely that one method is better than the other two.

TROUBLE SHOOTING

- The materials should be collected prior to the activity.

VOCABULARY

soil litter	*separator*
creepy crawler	*ground trap*

Activity 3:
How many small creatures live under patio or sidewalk stones?

TIME

45 minutes

SEASON

spring or fall

CLASS ORGANIZATION

groups of six to eight students per group

EQUIPMENT AND MATERIALS

For each group:

sidewalk or patio section
clipboard
paper
pencil

SKILLS AND TECHNIQUES

- making a map of an area
- counting small creatures
- using the key to identify small creatures
- recording data on the map
- using data collected to infer answers to the *Digging Deeper* questions

CONCEPTS

A population count of creatures that live under sidewalk or patio sections can be made. The patio or sidewalk can be viewed as a grid system since each section is of equal size.

SUGGESTIONS FOR VALUE TEACHING

After you have been allowed to use someone's property to conduct this activity what could you do to show your appreciation? List all of the ideas of your group and choose the ones that you decide are best to do.

CLUES TO QUESTIONS
Millipedes and centipedes are creatures typical of those found under sidewalk and patio sections. Millipedes feed on decaying vegetable matter; centipedes are carnivorous and feed on other small animals. The *Branching Out* sections suggest an experiment with the creatures under the slabs.

TROUBLE SHOOTING
- Finding a suitable patio and/or sidewalk section is critical to this activity. The sections should be able to be lifted easily.

VOCABULARY
overpopulated

Activity 4:
What type of place do pill bugs prefer?

TIME
60 minutes

SEASON
spring or fall

CLASS ORGANIZATION
small groups of three or four students per group

EQUIPMENT AND MATERIALS
For each group:
a cardboard shirt box (rectangular or square)
30 cm ruler or metre stick
pair of scissors
dry soil (sand)
small pebbles
window screening
grass cuttings
glass of water
10 pill bugs

SKILLS AND TECHNIQUES
- following directions in the diagram to construct a choice box
- controlling variables
- recording observations in the form of a diagram
- using observations to infer answers to the *Digging Deeper* questions

CONCEPTS
A pill bug (also sow bug, oniscus, woodlouse) is a crustacean that cannot tolerate the absence of moisture from its habitat. Consequently it lives in dark, moist places. If, by chance, it is removed from its natural habitat and placed in a bright, dry area for any length of time it will desiccate and die. Its range of tolerance is limited.

SUGGESTIONS FOR VALUE TEACHING
The following three lines are from a poem. Read them carefully. Notice how they rhyme. Study the stress on syllables shown by (lǐttle strêss) and (more strēss).

Ǎ pīll / bǔg īs / ǎ tȳpe / ǒf thīng (A)
Thǎt / līkes / ǒne kīnd / ǒf plāce. (B)
If I want it to live and sing (A)
______________________________ (B)

Complete the last line following the same rhyme scheme and number of syllables as the second line. Try to write a second verse following the same rules as the first. Discuss your completed poem with members of your group.

CLUES TO QUESTIONS
The pill bug when removed from its natural habitat moves very quickly to find another area with suitable conditions, before it desiccates and dies. However, its movements are not deliberate but rather random so that if it comes across a favorable area within a short-time period it can survive; otherwise, it will perish. The reaction is strictly by instinct for survival.

TROUBLE SHOOTING
- Strictly defined, the four sections of the choice box do not represent controlled variables except in the sense of size. For example, dry soil and moist cardboard make two variables that are changed rather than one as should be the case. Students might discuss their problem and devise an experiment in which the variables are controlled better. For example, the four sections of the choice box might be dry soil, wet soil, dry rocks, wet rocks. Any other combination of moist and dark areas will work.

VOCABULARY

pill bug
choice box

Activity 5:
On what kind of surface does an earthworm move fastest?

NOTE: The activity number in the text is a misprint. It should be *Activity 5* not *Activity 7*.

TIME

60 minutes to collect worms, set up the activity and conduct the first set of trials on the first surface

15 minutes to conduct each set of trials on each subsequent surface tested at intervals of 15 minutes

(Students can carry on other assigned studies during these intervals. A total of about two hours including intervals will be necessary.)

SEASON

spring or fall

CLASS ORGANIZATION

small groups of three or four students per group

EQUIPMENT AND MATERIALS

For each group:

several earthworms
cardboard box with moist soil
smooth surface (glass, desk top, Bristol board, etc.)
household materials such as vaseline, sandpaper, cooking oil, glass of water, etc.
a watch with a sweep second hand or a stopwatch

SKILLS AND TECHNIQUES

- observing worm movement carefully
- controlling variables (same earthworm but different surfaces; everything else kept constant)
- conducting several trials
- measuring time in seconds
- averaging results
- recording data on a chart
- using data collected to infer answers to the *Digging Deeper* questions

CONCEPTS

An earthworm moves by muscle construction along its body; it pulls its posterior end forward and then pushes its anterior end forward. The movement is similar to a snake's except that the segments of an earthworm completely surround the body but the muscle constructions in a snake occur along the scales on the underside of the body.

SUGGESTIONS FOR VALUE TEACHING

Read the following paragraph: Earthworms are slimy, ugly creatures that are completely revolting. After a rainfall, they crawl over the sidewalks and driveways only to be crushed underfoot or by car tires. They make a terrible mess. Worms are only good when they are used as bait for fishing. Someone should collect all earthworms and sell them to fishermen as bait. Do you agree with the writer? Make a plus (+) sign above any words or ideas with which you agree. Mark a minus (-) sign over any words or ideas with which you disagree. After you have marked the passage, discuss this "coded" paper with the other members of your group. Be prepared to state a reason for each plus or minus sign.

CLUES TO QUESTIONS

The efficiency of the pushing and pulling depends on the friction that exists between the worm's body and the surface on which it is lying. The friction is high when the worm moves in soil. In the experiment, each earthworm should record greater times for surfaces that are smooth or are treated to reduce friction. The *Branching Out* activities are designed to lead students to a better appreciation of earthworms and their value to people.

TROUBLE SHOOTING

- The most difficult factor to control in this activity is the effect of repeated trials on each earthworm. Therefore the rest periods in a suitably constructed habitat become most important. Also, the more earthworms that are tested by each group, or the whole class, the more reliable the results will be. Some earthworms may not perform and should be replaced by more lively specimens.

VOCABULARY

average

4. ON THE WING

Activity 1:
How can small winged creatures be caught?

TIME

Making a sweep net: 45 minutes
Using a sweep net: 30 minutes
Making a light trap: 30 minutes
Using a light trap: overnight
Making a "pooter": 20 minutes
Using a "pooter": 30 minutes

SEASON

spring or fall

CLASS ORGANIZATION

groups of five or six students to each group

EQUIPMENT AND MATERIALS

For each group:

Sweep net: wire coat hanger; pair of scissors; metre stick; piece of colored chalk; one metre of nylon netting (Cheesecloth will work, but not as well. Pantyhose is a third choice.); sewing needle; thread; one metre of 1 cm dowelling (A broom handle or hockey stick is fine.); bookbinding or adhesive tape.

Light trap: plastic ice-cream container; plastic bleach bottle; wire (A coat hanger will do.); pair of pliers; electric socket connected to a plug; 40 or 60 watt light bulb.

Pooter: large pill vial; milkshake straw; one metre of rubber or plastic tubing (large diameter) from a drug store; pair of scissors; some Plasticine; small piece of cheesecloth; cellulose tape.

SKILLS AND TECHNIQUES

- following directions - written and in diagram form
- sharing responsibilities among group members so as to complete tasks
- testing homemade equipment and collecting flying creatures
- using observations to infer answers to the *Digging Deeper* questions

CONCEPTS

Specialized pieces of equipment can be devised to catch winged creatures.

SUGGESTIONS FOR VALUE TEACHING

Complete the following sentences:

Making my own equipment makes me feel ______________________________.

Using equipment made by a company is ______________________________.

Thinking of new pieces of equipment that I can make is ____________________.

Working with other students to make equipment is ____________________.

Discuss your completed sentences with group members.

CLUES TO QUESTIONS

All creatures caught by the methods suggested are insects with one or two pairs of wings.

TROUBLE SHOOTING

- The availability of the proper materials is critical to this activity. Students should be actively involved in collecting materials several days before the day for constructing equipment. Since this activity depends on cooperation between home and school (e.g., setting up the light trap) an explanatory note to parents might be in order.

VOCABULARY

"pooter" or *aspirator*

Activity 2:
How can a cage be built to house small creatures that fly?

TIME

Research before building cages: 45 minutes
Cage 1: 45 minutes
Cage 2: 45 minutes
Cage 3: 30 minutes
Cage 4: 20 minutes

SEASON

spring or fall

CLASS ORGANIZATION

same groups as for *Activity 1*
(Each group should make a cage that is suitable to the type of animal that was caught in *Activity 1.*)

EQUIPMENT AND MATERIALS

For each group:

Cage 1: large cardboard box; sharp knife; pair of scissors; 30 cm ruler; masking tape; plastic bowl; nylon netting or cheesecloth; paper clip; suitable food.

Cage 2: plastic coffee can or ice-cream container lid; window screening (fiber glass or wire); pair of scissors; stapler or sewing needle and strong thread; flower pot with soil; plant; saucer.

Cage 3: plastic coffee can or ice-cream container lid; plastic ice-cream container; window screening (fiber glass or wire); stapler or sewing needle and strong thread; pair of scissors; pond water; twigs.

Cage 4: large wide mouth jar; cheesecloth or nylon netting; rubber band; twigs, rocks or other materials to suit the habitat from which the creature was taken.

SKILLS AND TECHNIQUES

- following directions in print and diagrammatic form
- sharing responsibilities among group members
- using observations to infer answers to the *Digging Deeper* questions

CONCEPTS

Cages can be made to simulate the natural living conditions in the habitats of creatures caught. Each animal requires certain conditions in order to survive.

SUGGESTIONS FOR VALUE TEACHING

Have each group organize a role-playing situation. Two students can debate whether wild animals should be kept captive in cages or not. They can discuss the animals that they have put in cages or caged animals in zoos. Give them time to prepare their thoughts before conducting the role play. Other group members can observe and can share their observations at the end of the session.

Activity 3:
How long does it take a fruit fly to complete its life cycle? Does it take more or less time when it is hot or cold?

TIME

Setting up experiment: 20 minutes
Leaving the trap outdoors: 2-3 hours
Preparing the egg-laying cage: 20 minutes
Egg laying and observing time: 24 hours
Temperature experiment:
(a) setting up: 45 minutes
(b) daily observation: 15 minutes/day for two weeks
Discussion and answering the *Digging Deeper* question at the end of two weeks: 45 minutes

SEASON

spring or fall

CLASS ORGANIZATION

groups of five or six students per group

EQUIPMENT AND MATERIALS

For each group:

4 large jars with wide mouths (3 of the jars must be the same size and shape)
piece of paper
tape
pair of scissors
ripe banana
hand magnifiers
3 thermometers (Immersion type is best.)
3 pans or plastic ice-cream containers in which the experimental jars can sit
a supply of ice cubes

SKILLS AND TECHNIQUES

- following written directions to make a fruit fly trap
- observing carefully using a hand magnifier
- measuring temperature in degrees Celsius
- controlling variables (The only manipulated variable should be temperature.)
- sharing tasks among group members over the two- to three-week period
- using observations to infer answers to the *Digging Deeper* questions

CONCEPTS

A fruit fly completes its life cycle in a fairly short-time period: about two weeks. The life cycle is a complete metamorphosis and includes the four stages of egg laying, larva, pupa and adult.

SUGGESTIONS FOR VALUE TEACHING

This activity has taken between two and three weeks to complete so we need to assess it. Have the students complete these statements individually:

1. *The most helpful thing anyone did during the activity was* ____________________.
2. *I was surprised that* ____________________.
3. *We really needed someone to* ____________.
4. *It was disappointing to me that* ________.
5. *It gave me a comfortable feeling when* __________________________________.
6. *I felt uncomfortable when* _______________.

Ask the students to discuss completed sentences with their group members. On which points does everyone agree? Disagree?

CLUES TO QUESTIONS

The time required for eggs to hatch and mature to the adult stage will vary. The most critical factor in this experiment is temperature. All other factors (variables) should be controlled.

Larvae leave the banana and crawl to the glass in order to pupate. This stage requires no food.

TROUBLE SHOOTING

- Since this activity requires a long-time period to complete, students will need to be reminded to make regular observations. Actually the activity might be divided into two parts: (1) the collecting of fruit flies and egg laying and (2) the experiment. The whole class could do the first part together and form into small groups for the experimental part. As in most experiments, some factors are easier to control than others. The number of eggs laid, the viability of the eggs, the maintaining of temperatures are all points to discuss during the interpreting of data.

VOCABULARY

factors

Activity 4:
How do butterflies taste foods?

TIME

60 minutes

SEASON

spring or fall

CLASS ORGANIZATION

small groups of three or four students per group, possibly the same groups as for *Activity 2* if students already have butterflies or moths in their cages as a result of this activity

EQUIPMENT AND MATERIALS

For each group:

butterflies and/or moths
sugar
water
toothpicks or strips of paper
Bristol board
scissors
paper clips

SKILLS AND TECHNIQUES

- following written directions
- controlling variables
- recording data in the form of a chart
- using data collected and observations to infer answers to the *Digging Deeper* questions

CONCEPTS

The taste sense in a butterfly or moth is located on the front legs or tarsus. When the animal tastes a desirable substance, it extends its proboscis which is normally curled up and held under the head. The proboscis is a long tube like a sucking mouth part and is suited to drinking liquids.

SUGGESTIONS FOR VALUE TEACHING

You have had some experience in handling live animals in this activity and others. Think of any wild creature in captivity. Brainstorm a list of rules with your group members that you think should be followed when handling animals. Rank order the rules from the most important to the least important.

CLUES TO QUESTIONS

Butterflies and moths prefer sweet liquids and, in their natural habitats, feed on plant nectar.

TROUBLE SHOOTING

- Sometimes a butterfly or moth will not react to the stimulus regardless of its thirst because of other instincts such as survival. In this case, the animal should be returned to its cage and tested again later in the day with no feeding in the interim.

VOCABULARY

dissolve

Activity 5:
At what different heights above the ground do small creatures fly?

TIME

45 minutes to set up
several hours for the equipment to be left at the site chosen (either overnight at a student's home or during school hours in the school neighborhood)
45 minutes to collect data
30 minutes to answer the *Digging Deeper* questions and discuss results

SEASON

spring or fall

CLASS ORGANIZATION

groups of five or six students per group (One possible approach would be to have each group set up the activity in a different area selected from the ones suggested in the activity. The results from the different groups can be compared at the end of the activity.)

EQUIPMENT AND MATERIALS

For each group:
jar of petroleum jelly (Vaseline)
5 cm x 5 cm x 3 m piece of wood
handsaw
compass
pill vials
materials for homemade tweezers (see page 38)
paper towels

SKILLS AND TECHNIQUES

- measuring distance in centimetres
- using a compass to determine direction
- counting specimens
- using observations to infer answers to the *Digging Deeper* questions

CONCEPTS

Some winged creatures have a range of heights at which they fly while others are limited to certain heights. The micro-climate effect of moving air varying at each level up to about 125 cm is in effect in this activity. See *Mini-climates*, Chapter 4.

SUGGESTIONS FOR VALUE TEACHING

This activity requires that small-winged creatures will likely be killed when they come in contact with the greasy pole. Whenever animals are killed during a science experiment, some people get upset. Nonsense! Real progress can only be made by sacrificing life. No one should worry about a few animals when people can profit and learn from their deaths.

How do you react to this paragraph? Write a reaction of agreement or disagreement and share your thoughts with your group members.

CLUES TO QUESTIONS

Temperature, humidity, wind speed and direction, time of day and plant life could affect the number and types of winged creatures caught. All of these factors will vary depend depending on the location of the pole and the conditions existing in the mini-climate.

TROUBLE SHOOTING

- Any winged creatures caught on the greasy pole will be very small and difficult to see. Large insects such as moths may have been caught momentarily and escaped. They may have left evidence of their struggle. Since so many different factors (identified above) can have affected the creatures caught, students should be encouraged to repeat the activity controlling these factors as suggested in the last *Digging Deeper* question.

CROSS REFERENCES

Mini-climates, Chapters 2, 3 and 4

Activity 6:
Can a bee tell other bees where food can be found?

TIME
30 minutes

SEASON
any season

CLASS ORGANIZATION
individually
(This activity could be used as a means of finding out how well students can set up an experiment and control the variables. Ability to do this is a major objective of this book.)

SKILLS AND TECHNIQUES
- controlling variables
- experimenting

CONCEPTS
The data presented indicates that the greatest number of bees flew in the direction of the plate having the sugar solution. If this data is correlated with the wagging dance that the original bees performed in the hive, it could be concluded that bees can communicate direction through their body movements. (Other factors such as coincidence should be discussed.) Students should be encouraged to conduct the *Branching Out* activity in order to apply their skills at setting up a controlled experiment.

TROUBLE SHOOTING
- The students must read carefully and study the data presented in order to answer the questions in *Digging Deeper*. The *Branching Out* section represents the creative aspect of the inquiry.

VOCABULARY
scent plate

5. SPIDERS ARE DIFFERENT

Activity 1:
How can spiders be collected?

TIME
45 minutes

SEASON
any season

CLASS ORGANIZATION
small groups of two or three students to a group

EQUIPMENT AND MATERIALS
For each group:
12 small jars with caps or large pill vials
2 or 3 pieces of cardboard larger than the mouth of each jar
pencil
flashlight

SKILLS AND TECHNIQUES
- collecting specimens
- following directions
- using imagination to think of other places to look for spiders
- observing carefully to find spiders
- labelling locations where spiders were found
- using observations to infer answers to the *Digging Deeper* questions

CONCEPTS
Spiders can be found almost anywhere. Different species live in different habitats. Some types of spiders can be found all year round.

SUGGESTIONS FOR VALUE TEACHING
In your small group, brainstorm a list of adjectives (describing words) that tell something about the spiders that you collected. Make your list as long as possible and include every word that your group members suggest. When your list is complete, start at the top of the list and discuss each word in turn. Is the adjective an observation or an inference.

Observation: Something that you can tell directly through one of your senses.
Inference: Something that you think might be true but that you did not observe.
Mark an "O" beside each adjective on which your group agrees and an "I" beside the words that you think are inferences.

Which words show how much you value spiders? Is there much evidence to support people's dislike for spiders?

CLUES TO QUESTIONS
Some spiders live upside down in their webs -- usually orb or wheel-shaped webs. The most important reason for their position is so that they can feel vibration from any part of the web as prey is caught in the strands. Apparently, the upside down position helps in this regard.

TROUBLE SHOOTING
- Students should be cautioned about handling large spiders and should be able to identify the widow, recluse and tarantula spiders on sight. If students plan to keep their spiders for other activities in the chapter, the *Branching Out* section will be important for each group.

Activity 2:
How can the spiders in your collection be identified?

TIME
45 minutes

SEASON
any season

CLASS ORGANIZATION
groups of two or three students to a group (The text used in this spider key is fairly complex because of its terminology and is recommended for older students who are capable readers. Younger students can use the pictures in the key to identify their spiders.)

EQUIPMENT AND MATERIALS
For each group:
specimens
hand magnifier

SKILLS AND TECHNIQUES
- observing spiders carefully using a hand magnifier
- using the key to identify each spider

CONCEPTS
Spiders can be classified according to body structure such as the position of fangs, the type of web they weave and hunting habits.

SUGGESTIONS FOR VALUE TEACHING
In Mexico and in some countries in Central America, some children keep tarantula spiders as pets. They tie a string loosely between the cephalothorax and abdomen and take their pet tarantulas for walks. What do you think of this pastime? Would you do it? Why do you think that the hobby might be popular? What do you think your parents would say if you did it?

CLUES TO QUESTIONS
Swollen palps on a spider indicate the male of the species. Sperm is secreted from the male's body and is stored in the palps so that it can fertilze the eggs carried by the female. Fertilization occurs when the male transfers the sperm from the swollen palps to an opening on the underside of the female's body -- a curious way of mating. Actually, the prime purpose of the palps in both males and females is to help crush and squeeze the juices from paralysed prey.

TROUBLE SHOOTING
- Since this is a progressive key, students should be totally convinced that each spider does not match the description in the text and diagram of one box before moving to the next. Extremely careful observations using a strong magnifier and viewing through the glass jar are important. Patience is the key. It may be necessary to poke the spiders gently to see the head parts and how the fangs are positioned. Students might use a straight pin taped to the end of a popsicle stick.

VOCABULARY
identification key
chelicerae or jaws
palp
cephalothorax
abdomen
spinnerets
true spider
cribellate spider
aerial web weavers
sheet web weaver
orb weaver
achaeranea spiders

Activity 3:
Is it true that spiders prefer live insects?

TIME
45 minutes to set up the experiment
20 minutes each day for five days to continue the experiment and make observations
15 minutes on the last day to discuss the results

SEASON
any season

CLASS ORGANIZATION
small groups of two or three students (Each group tests two or three of its spiders.)

EQUIPMENT AND MATERIALS
housefly colony for the whole class
data sheet like the one shown on page 72

SKILLS AND TECHNIQUES
- conducting a controlled experiment
- observing carefully
- recording observations in chart form
- stating a generalization based on data collected

SUGGESTIONS FOR VALUE TEACHING
Individually, complete the following sentences:

During the investigation I had to control my desire to ______________________.
I had a feeling of accomplishment when I ______________________.
I felt that I did not do a very good job at ______________________.
I feel that I would like to change the way in which I ______________________.

CLUES TO QUESTIONS
Spiders do not eat prey in the sense of chewing. They suck and squeeze the juices from the victim's body. Before dining, most spiders wrap their prey in silk after it has been stunned or paralysed by bites from the spider's fangs.
A spider can be kept alive for months on one spider a week.

TROUBLE SHOOTING
- All variables must be controlled in this experiment except for the critical one, that is, one dead fly and one live fly offered to the spider. Students should list all other factors that must be kept the same.

VOCABULARY
controlled equipment

Activity 4:
How strong is the silk produced by a spider?

TIME
45 minutes

SEASON
any season

CLASS ORGANIZATION
small groups of two or three students (Each group tests three or four of its spiders.)

EQUIPMENT AND MATERIALS
For each group:
pair of pliers
wire coat hanger
piece of adhesive or book binding tape
data sheet like the chart shown on page 73
pins, pennies, etc. to serve as masses
paper or Bristol board
pair of scissors
(An alternative way to make the frame is simply to bend a wire coat hanger so that the hook can be used as a handle and the shape of the frame is a rectangle or square

For the whole class:
2 or 3 equal arm balances and sets of gram masses

SKILLS AND TECHNIQUES
- constructing a wire frame
- controlling variables
- measuring in centimetres
- measuring mass in grams using an equal arm balance
- recording observations on a chart

CONCEPTS

Spider silk is stronger than it appears. Actually, spiders spin different strengths of silk for different purposes: dragline, supporting strands of a web, intricate threads of a web, silk for wrapping up a prey, and so on.

SUGGESTIONS FOR VALUE TEACHING

Read this short story to your group: Harry's mother is terrified of spiders. To help his mother, Harry catches spiders in his house and takes them outside. He enjoys pulling their legs from their bodies before killing them. Harry thinks that he is helping his mother and having fun at the same time. Is Harry right or wrong? Why?

What would you do in his place?

What would happen if everyone copied Harry's habit?

In what other way could Harry solve the problem?

Do you know of any "Harrys"?

What do you think should be done to people who treat animals in this way?

CLUES TO QUESTIONS

Larger spiders usually spin stronger silk. Spider silk has to be strong enough to withstand wind and struggling insects as well as provide support for the mass of its body. Another aspect of strength is how resilient the silk is. Students should be encouraged to investigate this phenomenon as shown in the photographs at the bottom of page 74.

TROUBLE SHOOTING

- Although 25 winds of spider silk around the frame is suggested in the activity, as many as possible should be done. The spread of the threads on the frame is the most difficult variable to control and should be recognized as such when interpreting the results. Some smaller spiders will not produce strong enough silk to support Bristol board plus the mass of several coins. Instead, paper can be used and staples or straight pins can be the masses. Students should be encouraged to experiment with objects that have different masses. Once these decisions are made the method of finding mass as well as the number and spreading of winds on the frame should be kept the same in order to compare spider silk strength.

VOCABULARY

to "milk" spiders
dragline

Activity 5:
How is an orb web constructed?

TIME

30 minutes
60 minutes for *Branching Out* section

SEASON

any season

CLASS ORGANIZATION

individually
same small groups of two or three students as for *Branching Out* section

EQUIPMENT AND MATERIALS

orb art:
  can of spray paint
  several pieces of construction paper (black or any other contrasting color to the paint)
  pair of scissors
  picture frame and/or acetate sheet (optional)

SKILLS AND TECHNIQUES

- observing photographs carefully
- inferring what happened between each photo in sequence
- using observations and inferences to answer *Digging Deeper* questions
- recording observations of an orb weaver in the form of a sketch
- making a model of an orb web *(Branching Out* section*)*

CONCEPTS

An orb web is an intricate pattern engineered by certain spiders to catch their prey. It is one of nature's most beautiful designs.

SUGGESTIONS FOR VALUE TEACHING

Answer these questions individually:

Have you asked a question about anything that you did with spiders?

Have any of your questions been the type that required you to conduct your own activity to find the answer?

Have you actually conducted an activity to answer your own questions?

Have you tried to find out something about spiders on your own time outside of school hours?

Have you spoken to anyone besides your classmates about their feelings towards spiders?

Have you handled (come close to) a spider outside of school hours?

If your answers to these questions are "yes" in each case, CONGRATULATIONS, you have caught the spirit of this book, and you have an idea of what real learning is all about.

CLUES TO QUESTIONS

Not all spiders play "a waiting game"; some spiders must go out and hunt for their food. (See key pages 67-70.) Spiders construct orb webs vertically to catch flying insects. An orb weaver can complete its intricate web in several hours. The web may last a day or several days depending on weather conditions, the number of prey caught, interference from man, etc. When the web is severely damaged, the spider will move on to a new location and a few hours later another orb web will glisten in the sun.

This chapter really is not complete until students have a chance to do some "orb art" outlined in the *Branching Out* section.

TROUBLE SHOOTING

- During the *Branching Out* section for orb art, the paper that is used should be slightly bowed (see the photograph on page 76) and moved slowly against the sprayed web. A steady hand is a must. White paint on black construction paper works best. Caution students to evacuate the spider from its web before spraying it.

VOCABULARY

orb web	*vertical*
engineer	*radical spokes*

Activity 6:
Which of your spiders will balloon?

TIME
45 minutes

SEASON
any season - spring is best when many spiderlings are available

CLASS ORGANIZATION
same small groups of two or three students as for previous activities

EQUIPMENT AND MATERIALS
For each group:
pencil
fan (optional)
data sheet like the one shown on page 77

SKILLS AND TECHNIQUES

- controlling variables
- following directions
- recording observations in the form of a chart

CONCEPTS
Ballooning is a phenomenon known only to spiders. It is detailed in the text portion of the activity.

SUGGESTIONS FOR VALUE TEACHING

Think of all the activities you have conducted with your group members in this chapter and how you worked together. Complete these sentences individually:

The most helpful thing anyone did during the investigation was ________________.

Of the things people did, I admired ________________________________.

We really needed someone to ____________.

I was surprised at ____________________.

It was disappointing to me that ________________________________.

One thing that I will do differently in any other group is ____________________.

Share your completed sentences with your group members. How do they feel about your responses? How do you feel about their responses? "Gossamer" is an old word used mostly in early literature as a name for the fine silky threads produced either by ballooning spiders or draglines caught in the breeze and floating on air. It is common in both prose and poetry.

The Branching Out section contains interesting information about spider silk and students may enjoy reading it. (Library research skills are always important objectives.) Sylvia's project shown on page 78 can be highlighted to show how a highly-motivated student conducted studies on her own. Encouraging students to pursue hobbies that are both self-satisfying as well as informative should be one of the major aims of schools.

TROUBLE SHOOTING

- Not all the students' spiders will balloon. This should not be discouraging as long as some of them do. You may have to find one or two "performers" before the lesson so as to ensure success. Small, young spiders are the best bet. Students should be encouraged to release their spiders when all of their investigations have been completed. They should be released in their natural habitats as marked on the original collecting jars.

VOCABULARY

ballooning
spiderlings
gossamer
rayon
cross hairs
optical instruments
nylon
textile industry
arachnid

6. CREATURES ON DISPLAY

Activity 1:
How can a killing jar be made?

TIME
20 minutes to make the killing jar
(Leave a day for the plaster of Paris to set.)
30 minutes to use the killing jar

SEASON
spring or fall

CLASS ORGANIZATION
small groups of three or four students per group

EQUIPMENT AND MATERIALS
For each group:
1 cup of plaster of Paris
2 or 3 styrofoam cups
3 or 4 popsicle sticks
water source
3 or 4 different sized jars (large mouth)
household cleaner or insecticide (controlled by teacher)
1 eyedropper
labels
paper
felt tip markers

SKILLS AND TECHNIQUES

- following directions
- handling killing fluids carefully

CONCEPTS
A killing jar is a quick, humane way to kill a small creature.

SUGGESTIONS FOR VALUE TEACHING

For the groups to discuss: Under what conditions should animals be purposefully killed? What animals are on the endangered species list? What should be done to make sure that these animals do not become extinct?

CLUES TO QUESTIONS
Always wash your hands after handling killing fluids.
Store the killing jars with the lid firmly attached and away from young children.
Small creatures should never be kept in the killing jar.
The killing jar must be clearly labelled.

TROUBLE SHOOTING

- Putting a large butterfly or moth in a small jar is defeating the purpose because of the damage to the wings. Time should be taken to discuss killing not only for the sensitive children who are reticent but also for the ones who seem to enjoy it and for the students who are noncommittal. This is a touchy subject that must be handled carefully but honestly. No child should be asked to take part in the activity if he/she expresses objection.

VOCABULARY

extinct
humanely
killing jar
insecticide
specimen

Activity 2:
How can a spreading board be made?

TIME
30 minutes to make
10 minutes to spread each winged insect
24 hours waiting period

SEASON
spring or fall

CLASS ORGANIZATION
same small groups of three or four students as for previous activity

EQUIPMENT AND MATERIALS
For each group:
1 corrugated cardboard box
1 pair of scissors
30 cm ruler
white glue
30 straight pins
2 or 3 pieces of blank, white paper

SKILLS AND TECHNIQUES
- following directions on a diagram
- following written directions

CONCEPTS
A spreading board is a device to set the wings and other appendages of an insect before pinning and labelling it.

SUGGESTIONS FOR VALUE TEACHING
What hobbies do you have?
How many hours a week do you devote to your hobbies?
Are hobbies important to you? Why?
In what hobbies would you like to get involved?
Is collecting and displaying small creatures a hobby that would interest you? Why?

CLUES TO QUESTIONS
Always avoid touching a winged insect with your hands since the legs and antennae might be damaged or the scales rubbed off the wings.
Paper strips are used to hold the wings in place and a straight pin taped to a popsicle stick can be used as a needle probe to move the body parts to the desired position.

TROUBLE SHOOTING
See "Clues" above.

VOCABULARY
spreading board

Activity 3:
How can you pin and label your specimens for display?

TIME
30 minutes for each creature displayed

SEASON
spring or fall

CLASS ORGANIZATION
same small groups of three or four students per group

EQUIPMENT AND MATERIALS
For each group:
Bristol board
pair of scissors
fine point pen for printing
insect pins #2 or 3 (straight pins will do)
piece of styrofoam
glue (airplane)
corks
display cases
baby food jars
cigar boxes
picture frames
cookie tins

SKILLS AND TECHNIQUES
- following directions -- diagram and written
- pinning specimens correctly
- labelling specimens correctly

CONCEPTS
The methods of pinning and labelling suggested are similar to the ways in which professionals prepare displays. Taxonomists and entomologists use these types of displays to compare other specimens caught and for further study.

SUGGESTIONS FOR VALUE TEACHING

Think of the activities that you have conducted with your present group members. Complete the following sentences individually:

Of everyone, ______ *seemed to get the most out of the activities.*

______ *and I seemed to understand each other pretty well.*

I felt the group didn't treat ______ *very fairly.*

I thought ______ *got less out of the activities than the rest.*

______ *got fair treatment from the rest of the group.*

I couldn't agree with what ______ *tried to do during an activity.*

Share your completed sentences with your group members remembering that it takes courage to discuss freely and honestly how well group members, with whom you are involved, work.

What do you think the aim of an evaluation exercise is?

CLUES TO QUESTIONS

Specimens should be identified by using the key in Chapter 1 of the field guides suggested in the Bibliography. The suggestions for displays contained in the *Branching Out* section are a natural conclusion to this chapter and should be implemented.

TROUBLE SHOOTING

- Specimens should be completely dried out before displaying (*Branching Out* section) to avoid mold and other fungus growth.

VOCABULARY

labelling

DATE DUE SLIP

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